INSECTS OF MICRONESIA

Diptera: Hippoboscidae; Streblidae[1]

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HIPPOBOSCIDAE

INTRODUCTION

The Hippoboscidae, or louse flies, of Micronesia were reported upon previously by Bryan (1926), Bau (1929), and Bequaert (1933, 1939, 1941); apparently they have been overlooked by general collectors. Only five species in three genera have been recorded; an additional genus with one species is here added to the list. The bibliography under each species covers only synonyms and published Micronesian records.

The following symbols indicate museums in which specimens are deposited: BISHOP (B. P. Bishop Museum), CM (Chicago Natural History Museum), KBH (Zoological Museum, Copenhagen), KU (Kyushu University), MCZ (Museum of Comparative Zoology), and US (United States National Museum). I am indebted to the authorities of these institutions for the privilege of studying and reporting on their collections of Micronesian Hippoboscidae.

The United States Office of Naval Research, the Pacific Science Board (National Research Council), the National Science Foundation, and Bernice P. Bishop Museum have made this survey and publication of the results possible. Field research was aided by a contract between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences, NR 160-175.

Zoogeography

Of about 2,500 islets in Micronesia, the Hippoboscidae have, so far, been collected from the following: Saipan, Tinian, Agiguan, Rota, Guam, Peleliu, Ponape, Kusaie, Wake, Arno, Bikini, Pokak, Rongerik, Onotoa, and Ocean. No hippoboscids have been collected in the Bonins, Volcanos, N. Marianas,

[1] This represents, in part, Results of Professor T. Esaki's Micronesian Expeditions (1936-1940), No. 128.

Yap, Truk, Caroline Atolls, Marcus, or Nauru. Of about 210 species of birds in Micronesia, only 10 species were found to have harbored the flies (see list below). Therefore it may be too early to undertake a faunal analysis. Obviously, however, these flies are poorly represented in this part of the world, particularly because the existing bird fauna is not rich and because nesting sites on those islets and atolls are scarce and provide few changes in environment. Some 80 species of hippoboscids are known to occur in islands and islets of the entire Pacific Ocean (see appendix). Undoubtedly, some of these (in addition to those enumerated below) will be added to the faunal list of Micronesia. In addition, we may expect to discover one or two endemic species from native birds. In any case, the general picture of the Micronesian faunal elements is unlikely to be much changed.

All genera here discussed are pantropical and are, at times, found in neighboring temperate countries. Of the six species enumerated, three are pantropical; two are widely spread over the Oriental Region; and one is Paleotropical. Again, two of the species are parasitic on marine birds; another two, generally on migrating land birds; and the remaining two, generally on breeding land birds. The dispersal of such flies is apparently through the agency of migrating birds. Of the two primary bird migration routes in Micronesia—one from eastern Siberia to New Zealand via the Marianas chain and another from the Philippines into the Carolines via Palau—the latter route appears to have played a much more important role in the dispersal of hippoboscids. In short, the hippoboscid fauna of Micronesia is obviously the result of repeated infiltrations, some successful, some not, of Oriental elements. To date, there is no clear evidence of infiltration from other regions.

For host-parasite relationships, the six species may be placed in two categories: one, which is found on fairly well-defined taxonomic or ecological bird groups; the other, on numerous unrelated bird groups. To the first category belong *Ornithoica pusilla, Icosta albipennis ardeae, Olfersia aenescens* and *Ol. spinifera*; and to the second, *Ornithoica exilis* and *Ornithoctona plicata.* A host-parasite list follows.

Galliformes, Phasianidae

Gallus gallus (Linnaeus) : *Ornithoica exilis, Ornithoctona plicata.*

Columbiformes, Columbidae

Ducula oceanica (Lesson and Garnot) : *Ornithoctona plicata.*

Gallicolumba kubaryi (Finsch) : *Ornithoctona plicata.*

Ptilinopus ponapensis (Finsch) : *Ornithoica exilis, Ornithoctona plicata.*

Charadriiformes, Laridae

Anous minutus Boie: *Olfersia aenescens.*

Ciconiiformes, Ardeidae

Demigretta sacra (Gmelin) : *Ornithoica pusilla, Ornithoctona plicata.*

Coraciiformes, Alcedinidae

Halcyon chloris albicilla (Dumont) : *Ornithoica exilis.*

Halcyon cinnamomina Swainson: *Ornithoica exilis.*

Passeriformes, Sturnidae

Aplonis opacus (Kittlitz) : *Ornithoica exilis.*

Passeriformes, Corvidae

Corvus kubaryi Reichenow: *Ornithoica exilis.*

Distribution of Micronesian Hippoboscidae and Streblidae

	Micronesian Island Groups						Other Localities
		Caroline					
	S. Mariana	Palau	Ponape	Kusaie	Marshall	Gilbert	
Hippoboscidae							
1. Ornithoica (Ornithoica) exilis	×		×				Thailand to Fiji, Samoa
2. O. (O.) pusilla					×		Tokelau Is., Tuamotu Is.
3. Ornithoctona plicata			×	×			Madagascar to Fiji
4. Icosta albipennis ardeae	×						Pantropical
5. Olfersia aenescens	×	×	×		×	×	Wake; Pantropical
6. Ol. spinifera					×		Wake; Pantropical
Streblidae							
1. Brachytarsina carolinae*		×					

* Described as new.

SYSTEMATICS

Key to Micronesian Genera and Species of Hippoboscidae

1. Wing with three crossveins (*rm, im,* and *mcu,* not including *h*) ; vein Cu + 1A fully developed, 2A hardly definable; ocelli present, large........ 2
   Wing with two crossveins (*mcu* always absent) ; vein Cu + 1A atrophied, leaving only very short stub at base; 2A distinct; ocelli absent........ 4
2. Apical half of vein R_{4+5} almost confluent with C; tarsal claws actually simple but seemingly bifid; antennal appendage subcylindrical, not or hardly longer than wide........ 3
   Vein R_{4+5} well apart from C except at extreme apex; tarsal claws actually bifid but seemingly trifid; antennal appendage leaflike or spoonlike, much longer than wide........**3. Ornithoctona plicata**

3. Abdominal tergite 6 in all sexes widely interrupted at middle; tergite 5 in gynandromorph narrowly so; anchorlike spines near abdominal apex of female and gynandromorph forming a large compact cluster at each side; abdominal spiracle 7 in male markedly larger than 6; male laterite 6 longitudinally linear .... **2. Ornithoica pusilla**
   Abdominal tergite 6 in female entire; tergite 5 in gynandromorph also entire; anchorlike spines near abdominal apex of female and gynandromorph widely separated from one another; abdominal spiracles 6 and 7 in male of similar size; male laterite 6 roundish.......... **1. Ornithoica exilis**
4. Postvertex much smaller, shorter and well defined from mediovertex; scutellum with pair of strong preapical bristles; lateral metathoracic callus simple, weakly swollen, with one or more series of strong spines.......**4. Icosta albipennis**
   Postvertex confluent with mediovertex, or when well definable, then much larger and longer than latter; scutellum with only ordinary soft hairs, no strong bristles; lateral metathoracic callus with only soft hairs; posteriorly strongly produced into fingerlike process.......... 5
5. Posterior part of cell *2m + 1a* as well as entire *2a* bare on both upper and lower surfaces; female pygidium strongly produced into pair of long, fingerlike processes; male aedeagus in profile distinctly longer than its basal apodeme .... **6. Olfersia spinifera**
   Posterior part of cell *2m + 1a* as well as entire *2a* bare on upper surface, microtrichiate on lower surface; female pygidium hardly produced, weakly emarginate; male aedeagus in profile as long as its basal apodeme.......... **5. Olfersia aenescens**

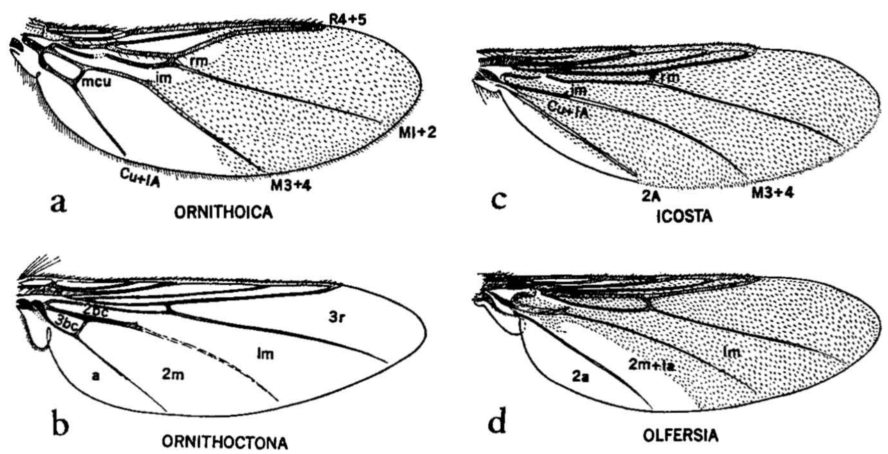


FIGURE 1.—Right wing: **a**, *Ornithoica exilis*; **b**, *Ornithoctona plicata*; **c**, *Icosta albipennis ardeae*; **d**, *Olfersia spinifera*. (Dots indicate microtrichiate areas. Redrawn and modified from Ferris 1925-1927; venational notations are mine.)

Genus **Ornithoica** Rondani

Ornithoica Rondani, 1878, Mus. Civ. Stor. Nat. Genova, Ann. **12**: 159 (type: *Ornithoica beccariina* Rondani; Amboina).

Frons anteriorly truncate, not reaching level of antennal apices; interantennal area concealed, separated from lunule by suture. Antennal pit single, not paired; antenna short, broad, subcylindrical; basal segments of antennae touching each

other. Postvertex usually setose, clearly definable from mediovertex, posterolaterally not touching inner orbit; ocelli present, large; occipital margin nearly straight; vertical bristle arising from nipplelike tubercle. Pronotum not or hardly visible in dorsal view. Humeral callus weakly developed. Anterior thoracic spiracle dorsolateral, small. Scutellum posteriorly convexly curved, with two or more pairs of bristles. Prothoracic presternum undefinable. Lateral metathoracic callus weakly swollen, with single series of dense strong setae. Wing fully developed, non-caducous; vein R three-branched, R_{4+5} strongly curved and with apical half almost confluent with C; three crossveins (*rm, im, mcu*); Cu +1A fully developed; 2A not or hardly traceable; axillary lobe lanceolate, normal in size; membrane not wrinkled, extensively microtrichiate; anal margin ciliate along its full length. Tarsal claws actually simple but seemingly bifid; empodium featherlike. Abdominal dorsum with four large median tergal plates, plate 3 (tergite 5) in gynandromorph very seldom narrowly interrupted at middle, plate 4 (particularly in male and gynandromorph) often widely interrupted at middle; laterites 3 to 5 never definable. Abdominal sternite 1 distinct, setose, more often setose-spinose; female with distinct supra-anal and pregenital plates and one or two pairs of pregenital tubercles; male genitalia normal.

Gynandromorph bilaterally symmetrical, similar to male in number of median tergal plates and in presence of spines on hind trochanter and of apparently functional genitalia; similar to female in presence of groups of anchorlike spines on abdominal venter; two anuses, with anterior one similar to that in normal male, posterior one evidently functional, similar to that in normal female but often more microsetose and more strongly exserted.

Puparium without setae, its posterior "cap" clearly divided into six sectors, each sector with 15 to 25 irregularly arranged pneustic pores. Gynandromorphism fairly common. Parasitic on birds.

This genus is worldwide in the tropics and subtropics, rare in temperate countries. It contains about 20 species and is divided into two subgenera. The following two species both belong to *Ornithoica* s. str. and each represents one of the four species groups of the subgenus.

1. **Ornithoica (Ornithoica) exilis** (Walker) (fig. 2).

   Ornithomyia exilis Walker, 1861, Linn. Soc. London, Jour. Proc., Zool. **5**: 254 (New Guinea, no host record; type in British Mus.).

   Ornithoica pusilla (in part): Bequaert, 1941, B.P. Bishop Mus., Occ. Papers **16**(11): 290 (Saipan, Palau, Ponape).

Scutellum with four to six pairs of preapical bristles. Thoracic sterna strongly spined. Wing 2.8-3.5 mm. long; cell *2bc* 2.7 to 3 times as long as wide, *3r* and *1m* almost entirely microtrichiate, *2m* hardly so. Abdomen with four (in female) or three (in male and gynandromorph) entire median tergal plates; tergite 6 in male and gynandromorph widely interrupted at middle. Female: Anterior and posterior pieces of supra-anal plate tightly soldered together; para-anal setal tuft conspicuous; pregenital plate anteriorly trilobed; urogenital area at each side with scattered anchorlike spines, of which the basal papillae are similar in size to those near abdominal spiracles 2 to 3, although a few of them may amalgamate into small multispinose warts. Gynandromorph: Urogenital area with similar spines as in female, and with tubercles and bristle tufts at sides of anterior anus; infra-anal plate ⊥-shaped; laterite 7 present. Male: Abdominal spiracles 6 and 7 similar in size; laterite 6 roundish.

DISTRIBUTION: Widely spread over the Oriental and Australian Regions. Among the Pacific islands, the species is at present definitely known from Taiwan, Philippines, Borneo, Waigiou, New Guinea, Key Is., New

Britain, Solomons, New Hebrides, Marianas (Saipan, Tinian, Rota, Guam), Carolines (Ponape), Fiji, and Samoa. It also occurs in Thailand, Sumatra, and Christmas I. (Indian Ocean).

S. MARIANA IS. SAIPAN: Female, no date, no host record, Marshall (US); male, off *Aplonis opacus guami,* Jan. 1945, Marshall and Dybas (CM); two males, five females, two gynandromorphs, off *Halcyon chloris*

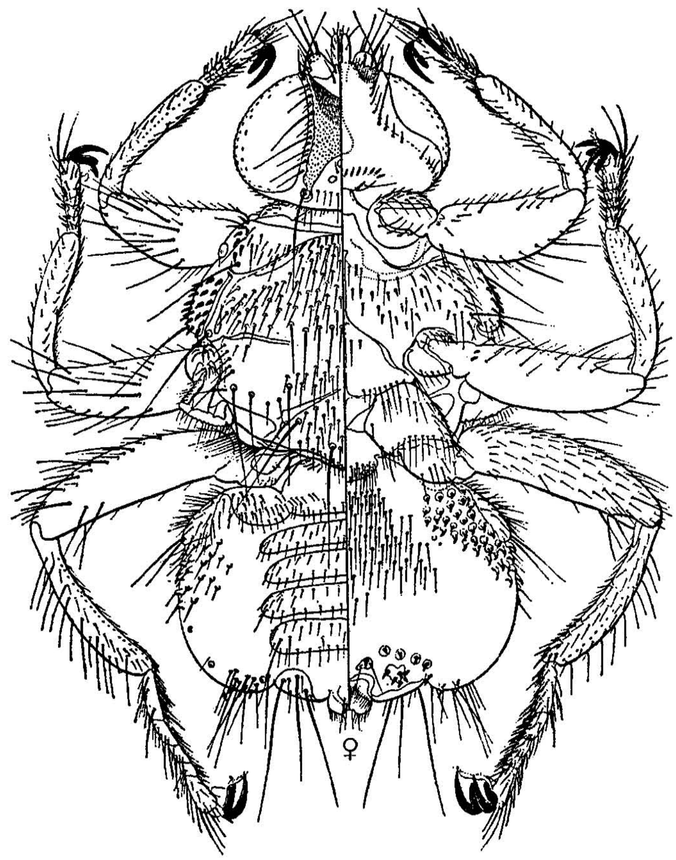


FIGURE 2.—*Ornithoica exilis,* female, with left and right halves of figure representing dorsal and ventral aspects respectively; wings detached. (After Ferris, 1925, Philippine Jour. Sci. **28**: 330, originally labeled as *O. promiscua* Ferris and Cole.)

albicilla, Dec. 1944 to Feb. 1945, Marshall and Dybas (CM); female, gynandromorph, off pigeon, July 1939, Fujishima (KU); two males, four females, two gynandromorphs, Garapan, no host record, Sept. 1939, Esaki (KU). TINIAN: 11 females, five gynandromorphs, off *Halcyon* sp., May 1944, Bailey (MCZ); male, off *Aplonis opacus guami,* Apr. 1945, Marshall

and Dybas (CM); three males, six females, two gynandromorphs, off *Halcyon chloris albicilla,* Apr. 1945, Marshall and Dybas (CM). ROTA: female, Sosan Isthmus, no host record, Oct. 1945, Walker. GUAM: Female, no host record, May 1945, Dybas (CM); male, two females, off *Aplonis opacus guami,* May 1945, Dybas (CM); 27 males, 49 females, 2 gynandromorphs, off *Halcyon cinnamomina cinnamomina,* May 1945, Dybas (CM); male, Fadang, off *Corvus kubaryi,* May 1945, Dybas (CM).

PONAPE. Five females, off *Halcyon cinnamomina reichenbachi,* no date, Coultas (MCZ); male, female, off *Ptilinopus ponapensis,* no date, Coultas (MCZ); female, Colonia, no host record, Jan. 1948, Hurlbut (US); female, Colonia, no host record, July-Aug. 1959, Wheeler and Wasserman (BISHOP); female, Net Dist., slopes of Mt. Temwetemwensekir (Tamatamansakir), off *Gallus gallus,* no date, Richards (US); female, same locality, off *Halcyon cinnamomina reichenbachi,* no date, Richards (US); male, three females, Sokehs I., no host record, Jan. 1948, Hurlbut (US).

HOSTS: Previously recorded from over 70 genera of land birds in 15 different orders, probably breeding on Coraciiformes, Passeriformes, Psittaciformes, Cuculiformes and Falconiformes. In Micronesia, it has been found on *Gallus* (Phasianidae), *Ptilinopus* (Columbidae), *Halcyon* (Alcedinidae), *Aplonis* (Sturnidae) and *Corvus* (Corvidae). Among these, apparently *Halcyon* and *Aplonis* are the preferred hosts.

2. **Ornithoica (Ornithoica) pusilla** (Schiner).

Ornithomyia pusilla Schiner, 1868, Reise Novara, Zool. Diptera **2**(1): 374 (Tahiti, off *Todiramphus vulneratus;* type in Vienna Mus.).

Ornithoica pusilla (in part): Bequaert, 1941, B. P. Bishop Mus., Occ. Papers **16**(11): 290 (Tahiti).

Scutellum with three to six pairs of preapical bristles. Thoracic sterna strongly spined. Wing 3.1-3.5 mm. long; cell *2bc* about 2.5 times as long as wide, *3r* and *1m* almost entirely microtrichiate, *2m* hardly so. Abdomen with three (in female and male) or two (in gynandromorph) entire median tergal plates; tergite 6 in all sexes and 5 in gynandromorph interrupted at middle. Female supra-anal plate clearly divided into large anterior and small posterior pieces; para-anal setal tuft very conspicuous; pregenital plate ⊥-shaped; urogenital area at each side with large roundish compact cluster of anchorlike spines, of which the basal papillae almost touch one another and are markedly larger than those near abdominal spiracles 2 to 3. Abdomen of gynandromorph with similar anchorlike spines as in female, no strong tubercles or bristle tufts at sides of anterior anus, no laterite 7. Male abdominal spiracle 7 noticeably larger than 6; laterite 6 longitudinally linear.

DISTRIBUTION: Marshall Is., Tokelau Is., Tuamotu Is., previously wrongly recorded from many other countries, including Madagascar.

MARSHALL IS. ARNO: Two males, three females, off *Demigretta sacra,* July 1950, Marshall (MCZ).

HOSTS: Recorded from several fish-eating birds in the Laridae, Ardeidae, and Alcedinidae, but the relative host preference is not quite clear.

Genus **Ornithoctona** Speiser

Ornithoctona Speiser, 1902, Term. Füzetek **25**: 328 (type: *Ornithomyia erythrocephala* Leach; Brazil).

Ornithopertha Speiser, 1902, Zeitschr. Hymen. Dipt. **2**: 167 (type: *Ornithomyia nitens* Bigot; Panama).

Frons anteriorly shallowly notched at middle, far from reaching level of antennal apices; interantennal area well exposed, not confluent with lunule. Antennal pits paired; antenna unusually large and long, flattened, leaflike or spoonlike. Postvertex bare, well defined from mediovertex, posterolaterally touching inner orbit; ocelli large; occipital margin almost straight; vertical bristle not arising from nipplelike tubercle. Pronotum not or hardly visible in dorsal view. Humeral callus very strong, hornlike. Anterior thoracic spiracle dorsolateral, fairly large. Scutellum posteriorly strongly convexly curved, with about eight preapical bristles loosely arranged in an arcuate series. Prothoracic presternum fairly large, bare. Lateral metathoracic callus simple, moderately swollen, practically bare, overlapped by strongly developed axillary with very dense and long setae along its outer margin. Wing fully developed, non-caducous; vein R with three branches, all normal; three crossveins (*rm, im, mcu*); Cu + 1A fully developed; 2A not or hardly definable; axillary lobe lanceolate, normal in size; membrane not wrinkled, entirely bare or partly microtrichiate at apex; anal margin not ciliate. Tarsal claws actually bifid but seemingly trifid; empodium featherlike. Abdominal dorsum in male with three large median tergal plates, in female these plates either very small or entirely absent; tergite 6 represented by pair of small, widely separated side pieces; laterites 3 to 7 not definable. Abdominal sternite 1 small, setose; female lacking supra-anal and pregenital plates; male genitalia normal. Puparium bare, its posterior "cap" clearly divided into six sectors, each sector bearing about 15 irregularly arranged pneustic pores. Gynandromorphism unknown. Parasitic on birds.

This genus is pantropical in distribution, with stray records from temperate countries. It contains nine species which may be allotted to three groups. Except for one species, all show little host specificity.

3. **Ornithoctona plicata** (von Olfers) (fig. 3).

Ornithomyia plicata von Olfers, 1816, De Veget. Anim. Corporibus **1**: 102 (Mauritius, no host record; type in Berlin Mus.).

Ornithomyia nigricans Leach, 1817, Gen. Spec. Eprobosc. Ins., 12, pl. 27, figs. 7-10 (Bengal, no host record; type in British Mus.).

Ornithomyia columbae Wiedemann, 1824, Analecta Ent., 60 (Java, apparently off *Columba,* though not so mentioned; type in Copenhagen Mus.).

Hyppobosca (sic) *australis* Guérin-Méneville, 1831, *In* Duperrey, Voy. Coquille, Atlas, pl. 21, fig. 12 (New South Wales, no host record; type in Paris Mus.).

Hippobosca sitiens Boisduval, 1835, *In* d'Urville, Voy. Astrolabe, Ent. 2: 667, pl. 12, fig. 16 (Fiji, no host record; type lost).

Ornithomyia asiatica Macquart, 1851, Soc. Sci. Lille, Mem. **1850**: 282, pl. 28, fig. 14 (Luzon, no host record; type in Paris Mus.).

Hippobosca viridipes Walker, 1858, Ent. Soc. London, Trans., n. ser. **4**: 235 (New South Wales, no host record; type in British Mus.).

Ornithomyia doreica Walker, 1861, Linn. Soc. London, Jour. Proc., Zool. **5**: 254 (New Guinea, no host record; type lost).

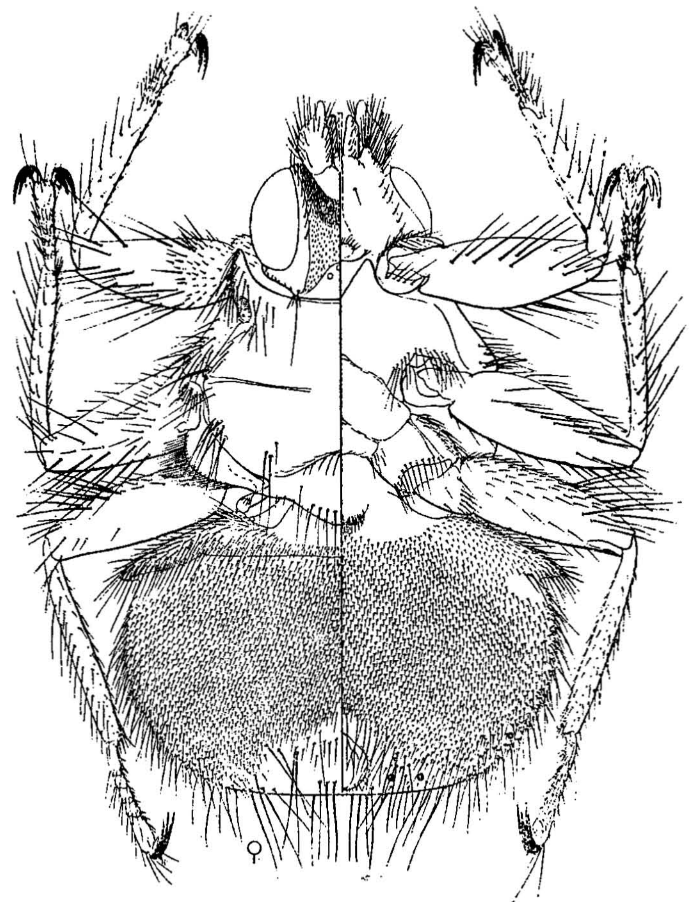


FIGURE 3.—*Ornithoctona plicata,* female, with left and right halves of figure representing dorsal and ventral aspects respectively; wings detached. (After Ferris, 1927, Philippine Jour. Sci. **34**: 215; originally labeled as *O. nigricans.*)

Ornithomyia batchianica Walker, 1861, Linn. Soc. London, Jour. Proc., Zool. **5**: 300 (Batjan, no host record; type lost; neotype, Gilolo, no host record, in Oxford Univ.).

Ornithomyia hatamensis Rondani, 1878, Mus. Civ. Stor. Nat. Genova, Ann. **12**: 158 (New Guinea, no host record; type in Genoa Mus.).

Ornithomyia batchiana Rondani, 1878, Mus. Civ. Stor. Nat. Genova, Ann. **12**: 158 (New South Wales, no host record; type in Genoa Mus.).

Ornithomyia hova Bigot, 1885, Soc. Ent. France, Ann. VI, **5**: 241 (Madagascar, no host record; type in coll. Collin).

Ornithomyia kanakorum Bigot, 1885, Soc. Ent. France, Ann. VI, **5**: 244 (New Caledonia, no host record; type in coll. Collin).

Ornithoctona vitrina Speiser, 1904, Mus. Civ. Stor. Nat. Genova, Ann. **41**: 343 (Tonga Is., no host record; type in Berlin Mus.).

Ornithoctona melaena Speiser, 1904, Mus. Civ. Stor. Nat. Genova, Ann. **41**: 347 (Sumatra, no host record; type lost).

Ornithoctona magna Ferris, 1926, Sarawak Mus. Jour. **3**(3): 285, pl. 11, fig. 2, e-h (Sarawak, off *Streptopelia chinensis tigrina;* holotype lost; allotype in Univ. California, Berkeley).

Ornithomyia tropica Kishida, 1932, *In* Uchida et al., Icon. Ins. Jap., ed. **1**: 244, fig. 473 (Taiwan, off *Dicrurus* sp.; type in coll. Kishida).

Ornithoica annalis Kishida, 1932, *In* Uchida et al., Icon. Ins. Jap., ed. **1**: 247, fig. 479 (Japan, off *Gorsakius goisagi;* type in coll. Kishida).

Ornithoctona plicata: Bequaert, 1939, Mushi **12**: 81 (Ponape, Kusaie); 1941, B. P. Bishop Mus., Occ. Papers **16**(11): 263 (Ponape, Kusaie). — Maa, 1963, Pacific Ins., Monogr. **6**: 159, figs. 23, 25, 27, 30, 33, 35, 37, 39 (Carolines).

Ornithoctona australasiae: Bau, 1929, Zool. Anzeiger **85**: 10 (Ponape) (misidentification, not of Fabricius 1805).

Antennal apex spatulate, broadly rounded, slightly twisted outward. Scutellum with four to six pairs of preapical bristles. Prosternal process short, acute. Wing 9.5-11 mm. long, its membrane entirely bare, no microtrichia. Apex of fore tibia in female ventrally produced into large, bluntly rounded lamella; in male bearing tuft of short strong setae. Abdomen in female lacking median tergal plates; in male with three such plates. Male aedeagus in profile twice as long as its basal apodeme, apically subacute; paramere in profile subacute and strongly curved at apex.

DISTRIBUTION: Widely spread over Palaeotropics except continental Africa; with stray records from neighboring temperate countries. In Micronesia, the species has so far been found on the larger islands of Ponape and Kusaie. Among other Pacific islands it definitely has been recorded from Kurile Is., Japan, Taiwan, Philippines, Borneo, Java, Flores, Wetar, Buru, Ceram, Batjan, Gilolo, New Guinea, Aru Is., Australia, Bismarcks, Solomons, New Hebrides, New Caledonia, Loyalty Is., Fiji, Samoa, and Tonga.

PONAPE. Female, off *Ducula oceanica,* June 1956, Marshall (BISHOP); female, off *Carpophaga* [=*Ducula*] sp., no other data (KBH); male, no host record, Feb. 1948, Hurlbut (US); female, off *Gallicolumba kubaryi,* Coultas (MCZ); female, off *Ptilinopus ponapensis,* no date, Coultas (MCZ); female, Nanipil-Nahnalaud, off *Ducula oceanica townsendi,* Jan. 1938, Esaki

(KU); two males, two females, Nanipil rain forest, off *Gallicolumba xanthonura* [probably error for *G. kubaryi*], May 1956, Marshall (BISHOP); two males, five females, Nihpit, no host record, July 1939, Esaki (KU); male, Nihpit-Kapiroi-Lehdau (Reitao), no host record, July 1939, Esaki (KU); female, Nihpit-Ngihneni (Ninoani), off *Ducula oceanica townsendi,* Jan. 1938, Esaki (KU); male, One-Nihpit, no host record, July 1939, Esaki (KU); male, Palikir, off *Gallicolumba xanthonura* [? error for *G. kubaryi*], Sept. 1955, Marshall (US).

HOSTS: Previously recorded from about 50 genera of land birds belonging to 12 different orders; probably breeding on Columbiformes, Passeriformes, and perhaps Falconiformes. In Micronesia, it appears almost confined to Columbidae (*Ducula, Gallicolumba, Ptilinopus*).

Genus **Icosta** Speiser

Olfersia Say, 1823, Acad. Sci. Philadelphia, Jour. **3**: 101 (type: *Olfersia albipennis* Say; North America).

Icosta Speiser, 1905, Zeitschr. Hymen. Dipt. **5**: 358 (type: *Olfersia dioxyrhina* Speiser; New Guinea).

Ornithoponus Aldrich, 1923, Ins. Inscit. Mens. **11**: 77 (type: *Feronia americana* Leach; North America).

Lynchia: Bequaert, 1926, Psyche **32** (for 1925): 266 (misinterpretation, not of Weyenbergh 1881).

Frons anteriorly produced into two strong lobes which reach or exceed level of antennal apices; interantennal area well exposed, not confluent with lunule. Antennal pits paired; antenna normal, short, broad. Postvertex bare, much smaller and well defined from mediovertex, posterolaterally touching or nearly touching inner orbit; ocelli almost always wanting; occipital margin at most very weakly convex or concave; vertical bristle not arising from nipplelike tubercle. Pronotum not or hardly visible in dorsal view of insect. Humeral callus very strong, hornlike. Anterior thoracic spiracle usually lateral and normal in size. Scutellum posteriorly convexly curved, very seldom truncated, always with single pair of widely separated preapical bristles. Prothoracic presternum fairly large, setose. Lateral metathoracic callus simple, weakly swollen, with strong spines. Wing fully developed, non-caducous; vein R with three branches, all normal; two crossveins (*mcu* absent); Cu + 1A atrophied, leaving very short stub at base; 2A strong; axillary lobe lanceolate, usually normal in size; membrane not wrinkled, extensively microtrichiate; anal margin not ciliate. Tarsal claws actually bifid but seemingly trifid; empodium featherlike. Abdominal dorsum medially with broad, transversely striolate area; tergite 3 (and rarely 5) represented by small transverse plate which is sometimes absent; tergite 4 never distinct, 6 very large; laterites 3 and 4 rarely definable. Abdominal sternite 1 weakly sclerotized, finely setose; female lacking supra-anal plate, rarely with very small pregenital plate; male genitalia normal. Puparium bare, its posterior "cap" clearly divided into six sectors, each sector bearing 10 to 30 pneustic pores in U-shaped arrangement along outer and intersectorial margins. Gynandromorphism unknown. Parasitic on birds.

Since the appearance of Bequaert's paper (1926, Psyche **32**: 266), this genus generally has been misnamed *Lynchia* (see Maa, 1963, Pacific Ins.,

Monogr. **6**: 103). From our present knowledge of early literature and by strict application of the law of priority, it should be *Olfersia* Say (1823), which antedates *Olfersia* Wiedemann (1830). However, as the last name is now commonly used for a quite different group of hippoboscids, to avoid confusion, the name *Icosta* Speiser (1905) is here accepted. (See footnote, p. 264.)

Icosta is worldwide in distribution, contains over 40 species, and is divisible into 10 well-defined species groups.

4. Icosta albipennis ardeae (Macquart) (fig. 4).

Olfersia ardeae Macquart, 1835, Hist. Nat. Ins. Dipt. **2**: 640, pl. 24, fig. 10 (Sicily, off heron; type lost).

Olfersia botauri Rondani, 1879, Soc. Ent. Ital., Boll. **11**: 22 (Italy, off *Ardea purpurea;* type in Florence Mus.).

Lynchia setosa Ferris, 1927, Philippine Jour. Sci. **34**: 224, figs. 14-15 (Philippines, off *Bubulcus ibis coromandus;* type in Univ. California, Berkeley).

Genal area rounded anteroventrally. Palpus hardly longer than median length of frons plus lunule. Inner orbit broad, shining, with three or more series of short setae. Postvertex much shorter than mediovertex, anteriorly rounded or truncated; ocelli absent. Eye normal in size. Length of upper orbit distinctly less than width of inner orbit. Prescutum largely bare, anterolaterally with small patch of short setae. Anterior thoracic spiracle linear, dorsolateral. Scutellum distinctly shorter than scutum, medially furrowed, posteriorly convexly curved; scutellar bristles lateral, not submedian. Metabasisternal process absent. Wing 4.5-6 mm. long, fairly broad, uniformly microtrichiate, leaving only posterior margin of cell *2a* bare. Legs densely setose; outer and inner apical lobes of segments 4 and 5 of fore tarsus similar in length. Abdomen largely membranous, densely setose (dorsal striolate area sparsely so); median plate of tergite 3 small in female, untraceable in male; tergites 4 and 5 membranous in both sexes; laterite 3 not or poorly defined. Male postgenital plate apically bilobed and setose; aedeagus in profile about 1.5 times as long as its basal apodeme, very broad at base, acute and gently decurved at apex; apical part of paramere in profile acute, more strongly decurved than aedeagus. Female abdominal setae on submedian area of venter spinelike and markedly more robust than those on median area; pregenital plate distinct, small; postgenital plate evenly, very sparsely setose; setae edging anterior part of urogenital area markedly longer and stronger than elsewhere on abdominal membrane; laterite 7 absent.

DISTRIBUTION: Widely spread over Old World, more abundant in the tropics and subtropics. Previously unrecorded in Micronesia, it is at present known only from Ponape. Among other Pacific islands, the species has been found in Japan, Taiwan, Philippines, and Australia. The nominotypical subspecies, *I. albipennis albipennis* Say, 1823, occurs in the New World.

S. MARIANA IS. SAIPAN: Male, no host record, no date, Marshall (US).

HOSTS: Obviously breeding on Ciconiiformes, particularly Ardeidae. Straying occasionally to Anseriformes, Falconiformes, Gruiformes, Charadriiformes and Strigiformes.

Genus **Olfersia** Wiedemann

Olfersia Wiedemann, 1830, Aussereur. Zweifl. Ins. **2**: 605 (new name for *Feronia* Leach, 1817) (type: *Feronia spinifera* Leach; Hawaii). Name preoccupied by *Olfersia* Say, 1823.

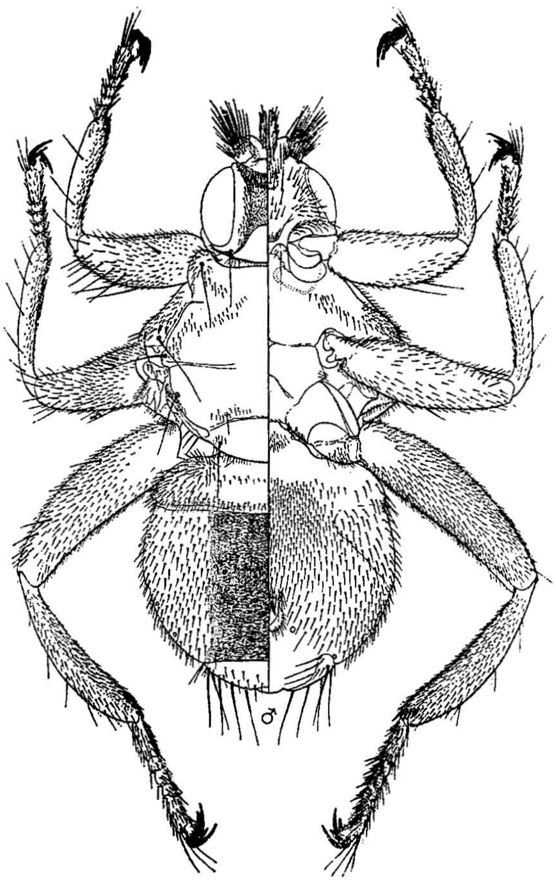


FIGURE 4.—*Icosta albipennis ardeae,* male, with left and right halves of figure representing dorsal and ventral aspects respectively; wings detached. (After Ferris, 1927, Philippine Jour. Sci. **34**: 227; originally labeled as *Lynchia setosa.*)

Feronia Leach, 1817, Gen. Spec. Eprobosc. Ins., 4 (type: *Feronia spinifera* Leach; Hawaii). Name preoccupied by *Feronia* Latreille, 1817.

Pseudolfersia Coquillett, 1899, Canadian Ent. **31**: 336 (type: *Pseudolfersia maculata* Coquillett = *Lynchia fumipennis* J. Sahlberg; Finland).

Frons anteriorly angularly notched at middle and exceeding level of antennal apices; interantennal area well exposed, confluent with lunule. Antennal pits paired; antenna normal, short, broad. Postvertex bare, either confluent with or much larger and poorly defined from mediovertex, posterolaterally touching inner orbit; ocelli wanting; occipital margin strongly, convexly curved, often with pair of deep submedian notches; vertical bristle not arising from nipplelike tubercle. Pronotum not or hardly visible in dorsal view. Humeral callus very strong, hornlike. Anterior thoracic spiracle lateral, normal in size. Scutellum posteriorly truncate or subtruncate, lacking preapical bristle. Prothoracic presternum small, bare. Lateral metathoracic callus strong, with only soft setae, posteriorly produced into large fingerlike lobe. Wing fully developed, non-caducous; vein R with three branches, all normal; two crossveins (*mcu* absent); Cu + 1A atrophied; 2A well developed; axillary lobe lanceolate, normal in size; membrane not wrinkled, but extensively microtrichiate; anal margin not ciliate. Tarsal claws bifid but seemingly trifid; empodium featherlike. Abdominal dorsum medially with broad transversely striolate area; tergite 3 represented by single or paired transversely linear median plates, 4 and 5 not definable, 6 large; laterite 3 poorly defined, 7 (in female) small, others entirely untraceable. Abdominal sternite 1 small, finely setose; female lacking supra-anal plate, pregenital plate generally wanting; male genitalia normal, external lateral process unusually large. Puparium densely setose, posterior "cap" with broad median groove, laterally not clearly divided into sectors but rather uniformly covered with pneustic pores. Gynandromorphism unknown. Parasitic on birds.

The name *Olfersia* Wiedemann is evidently preoccupied by *Olfersia* Say (see above) and is here conserved merely because of its conventional usage and because of the possibility that Leach published this name before Say did.[2] The genus is pantropical in distribution and contains seven species which may be allotted to four groups. The following two species both belong to the *spinifera* group.

5. Olfersia aenescens C. G. Thomson.

Olfersia aenescens C. G. Thomson, 1869, Freg. Eugenies Resa, Dipt., 610 (Keeling I. in Indian Ocean, no host record; type in Stockholm Mus.). — Bequaert, 1939, Mushi **12**: 82 (Palau, Ponape); 1941, B. P. Bishop Mus., Occ. Papers **6**: 277 (Palau, Ponape).

Olfersia erythropsis Bigot, 1885, Soc. Ent. France, Ann. VI, **5**: 239 (New Caledonia, no host record; type in coll. Collin). — Bequaert, 1933, Psyche **40**: 103 (Ponape).

Pseudolfersia diomedeae Coquillett, 1901, Washington Acad. Sci., Proc. **3**: 379 (Galapagos, off *Diomedea irrorata*; type in U. S. National Mus.).

Frons anteriorly rather deeply notched at middle. Postvertex anteriorly reaching ptilinal suture, anterior two-fifths dull, posterior three-fifths shining, posterior margin separated from that of upper orbit by deep notch. Length of upper orbit subequal to width of inner orbit. Wing 6.5-8 mm. long; vein R_{4+5} partly setose on upper side, M_{1+2} entirely bare on both upper and lower sides; *im* weakly slanting and much closer to

[2] Since this paper was sent to press, through the kindness of Mr. H. Oldroyd of the British Museum (Natural History), I was able to see the paper in which Leach did publish the name *Olfersia* for *Feronia spinifera* [1817, Novem., Edinburgh Encycl. 12(1): 162]. Therefore, as I suspected earlier (1963: 7), the authorship of *Olfersia* should be credited to Leach 1817, instead of to Say 1823 or to Wiedemann 1830.

M-stem than to *rm*; cell *1bc* long, narrow, nearly parallel-sided, hardly bulged near apex; *2bc* slightly bulged at midlength; posterior half of *2m* +*1a* and entire *2a* bare on upper surface, microtrichiate on lower surface. Posterior margin of syntergite 1 + 2 gently, broadly concave, not forming submedian lobes. Female pygidium weakly emarginate at apex; pregenital plate small, roundish. Male lacking pregenital plate; aedeagus in profile distinctly longer than its basal apodeme; paramere apically subacute in profile. Puparium with T-shaped setae.

DISTRIBUTION: Pantropical in the Pacific, Atlantic, and Indian Oceans. In Micronesia, it is known so far from S. Mariana, Palau, Ponape, Marshall, Gilbert, and Wake Islands. Among other Pacific islands, the species has been found on Goenoeng Api, Queensland, Fiji, Hawaii, Palmyra, Jarvis, Phoenix, Tokelau, Austral, Marquesas, Tuamotu, Mangareva, Ducie, Cocos, and Galapagos Islands.

S. MARIANA IS. SAIPAN: Male, 2-3 km. E. of Tanapag, on man, late afternoon, Jan. 1945 (CM). AGIGUAN: Male, no host record, May 1952, Kondo (BISHOP). GUAM: Male, Sumay, "Philippine Clipper," no host record, Dec. 1938, Oakley (US).

PALAU. PELELIU: Female, Akarokuru, no host record, Feb. 1938, Esaki (KU).

PONAPE. Male, two females, off *Anous minutus,* no date, Coultas (MCZ).

WAKE. Four females, no host record, Feb. 1953, Joyce (BISHOP); two females, no host record, 1937, Hadden (BISHOP); two males, female, Peale I., in quarters, might have dropped from bird, July 1940, Lyons (BISHOP).

MARSHALL IS. BIKINI: Male, two females, no host record, Apr. to May 1946, Morrison (US). POKAK: Male, two females, at sea, 0.5-1 km., no host record, Mar. 1952, F. R. Fosberg (870) (BISHOP); three males, five females, Sibylla I., no host record, July 1952, Fosberg (1215) (BISHOP); male, three females, Sibylla I., from around camp, no host record, July 1952, Fosberg (1283) (BISHOP). RONGERIK: Three females, July 1946, Morrison (US).

GILBERT IS. ONOTOA: Female, Tanyah (Buiartun) I., sea rampart N. of camp, July 1951, Moul; female, Tanyah I., at light, July 1951, Moul (BISHOP).

HOSTS: Previously recorded from about seven genera of marine birds belonging to Pelecaniformes, Procellariformes, and Charadriiformes. In Micronesia, it has been found only on *Anous* (Laridae).

6. **Olfersia spinifera** (Leach) (fig. 5).

Feronia spinifera Leach, 1817, Gen. Spec. Eprobosc. Ins., 11, pl. 26, figs. 1-3 (no locality, no host record, type lost; neotype, Laysan I., no host record, in Bishop Mus.).

Ornithomyia unicolor Walker, 1849, List Dipt. Ins. Brit. Mus. **4**: 1144

(Jamaica, off *Fregata aquila;* type in British Mus.).

Olfersia courtilleri Courtiller, 1853, Soc. Linn. Dept. Maine-et-Moire, Ann. **1**: 196, pl. 15 (France, off *Fregata minor;* type in coll. Collin).

Olfersia sulcifrons C. G. Thomson, 1869, Freg. Eugenies Resa, Dipt., 611 (Panama, no host record; type in Stockholm Mus.).

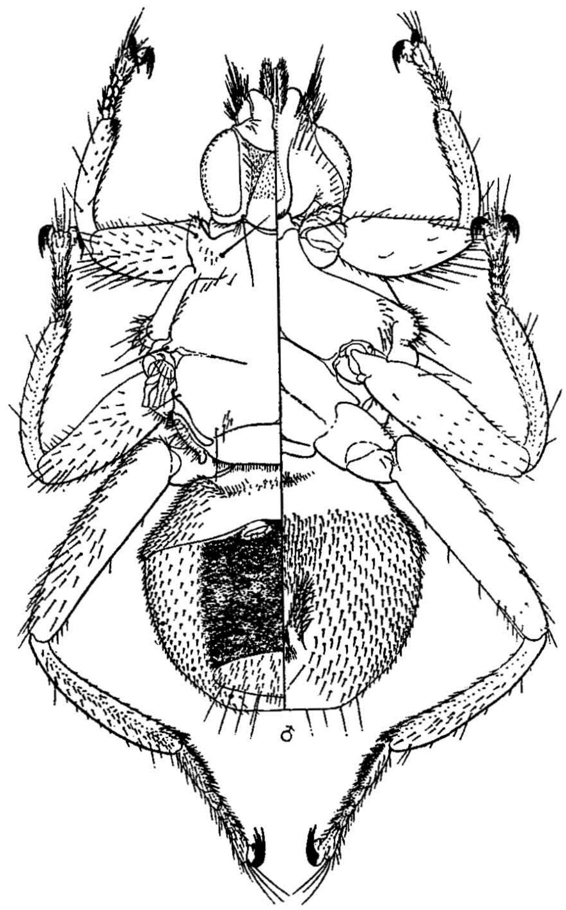


FIGURE 5.—*Olfersia spinifera,* male, with left and right halves of figure representing dorsal and ventral aspects; wings detached. (After Ferris, 1927, Philippine Jour. Sci. **34**: 221.)

Olfersia spinifera: Bryan, 1926, B. P. Bishop Mus., Bull. **31**: 71 (Wake I., Ocean I.).

Similar to *O. aenescens* as described above, differing in following characters: Shining area of postvertex generally less extensive; wing 7-9.5 mm. long, vein *im* strongly slanting, posterior half of cell *2m* + *1a* and entire *2a* bare on both upper and lower

surfaces; female pygidium strongly produced into a pair of long lobes, pregenital plate large, triangular; male with bare elongate pregenital plate, aedeagus in profile subequal in length to its basal apodeme, paramere in profile apically acute.

DISTRIBUTION: Pantropical in the Pacific, Atlantic, and Indian Oceans. In Micronesia, the species is at present known from Wake Atoll and Marshall Is. and according to Bryan (1926) from Ocean I. Bequaert [1941, B. P. Bishop Mus., Occ. Papers **16**(11):275; 1957, Ent. Americana, n. ser. **36**:431, 433] listed it from "Canton I., Gilbert Is." Canton I., however, is in the Phoenix Is., not the Gilberts. Among other Pacific islands the species has been recorded from the Philippines, Solomons, New South Wales coast, Kure I., Fiji, Phoenix Is. (Canton I.), Johnston I., Christmas I., Howland I., Jarvis I., Hawaii, Tuamotu Is., Marquesas, and Galapagos.

WAKE. Male, two females, no host record, Aug. 1923, Bryan (BISHOP); female, no host record, May 1959, Oshiro (BISHOP).

MARSHALL IS. BIKINI: Two males, no host record, Apr. to May 1946, Morrison (US). RONGERIK: Male, no host record, July 1946, Morrison (US). POKAK: Female, Sibylla I., no host record, July 1952, Fosberg (1185) (BISHOP).

HOSTS: Obviously breeding on *Fregata* (Fregatidae), occasionally found on *Pelecanus* (Pelecanidae) or *Phalacrocorax* (Phalacrocoracidae); all are marine birds belonging to Pelecaniformes. There are no definite host records from Micronesia.

APPENDIX

Check List of Hippoboscidae of the Pacific Islands

The following list is intended to supersede the one by Thompson (1938) which contained only 16 species (including one species determined only to genus) and did not include the forms from the Western Pacific, Australia, and New Zealand. A few undescribed species in different collections are necessarily omitted. For descriptions and synonymy, reference may be made to my earlier papers (Pacific Ins., 1963, Monogr. **6**; 1966, Monogr. **10**).

Ornithoica (*Ornithoica*) *unicolor* Speiser, 1900. Borneo. (Extralimital: Burma, Thailand, Malaya, Sumatra.) On Strigidae.

Ornithoica (*Ornithoica*) *beccariina* Rondani, 1878. Amboina, W. Australia. On Ardeidae.

Ornithoica (*Ornithoica*) *vicina* (Walker), 1849, Hawaii. (Extralimital: Nearctic and Neotropical Regions.) Chiefly on Passeriformes and Strigiformes.

Ornithoica (*Ornithoica*) *zamicra* Maa, 1966. New Guinea. On Passeriformes, particularly Meliphagidae and Muscicapidae.

Ornithoica (*Ornithoica*) *rabori* Maa, 1966. Philippines. On Passeriformes.

Ornithoica (*Ornithoica*) *bistativa* Maa, 1966. Borneo. (Extralimital: Thailand, Malaya). On Passeriformes, particularly Muscicapidae.

Ornithoica (*Ornithoica*) *philippinensis* Ferris, 1927. Philippines. Chiefly on Passeriformes.

Ornithoica (*Ornithoica*) *stipituri* (Schiner), 1868. New Guinea, New Britain, Queensland, New South Wales. Chiefly on Passeriformes and Coraciiformes.

Ornithoica (*Ornithoica*) *tridens* Maa, 1966. Taiwan. On Passeriformes, particularly Corvidae and Muscicapidae.

Ornithoica (*Ornithoica*) *momiyamai* Kishida, 1932. Japan. On Passeriformes.

Ornithoica (*Ornithoica*) *simplicis* Maa, 1966. New Guinea, Borneo, Taiwan. (Extralimital: Malaya, Vietnam.) Chiefly on Passeriformes.

Ornithoica (*Ornithoica*) *exilis* (Walker), 1861. See discussion of species.

Ornithoica (*Ornithoica*) *podargi* Maa, 1966. New Guinea. On Podargidae.

Ornithoica (*Ornithoica*) *aequisenta* Maa, 1966. New Britain, Solomons. On Columbidae.

Ornithoica (*Ornithoica*) *punctatissima* Maa, 1966. Solomons. On Megapodiidae.

Ornithoica (*Ornithoica*) *pusilla* (Schiner), 1868. See discussion of species.

Ornithoica (*Lobolepis*) *submicans* Maa, 1963. Philippines. On Bucerotidae.

Ornithoica (*Lobolepis*) *curvata* Maa, 1963. Borneo. (Extralimital: Thailand.) On Bucerotidae and Picidae.

Ornithoica (*Lobolepis*) *hirtisternum* Maa, 1963. New Guinea. On Bucerotidae.

Ornithophila metallica (Schiner), 1864. Bering I., Taiwan, Philippines, Indonesia, New Guinea, Australia, Bismarcks, Solomons, New Hebrides, Loyalty Is., New Caledonia, Fiji, Samoa, Tonga. (Extralimital: Africa, Madagascar to Thailand and Malaya.) Chiefly on Passeriformes, Coraciiformes, and Piciformes.

Ornithomya avicularia (Linnaeus), 1758. Japan, Australia, New Zealand. (Extralimital: Palaearctic Region.) Chiefly on Passeriformes, Falconiformes, Psittaciformes, Charadriiformes and Strigiformes.

Ornithomya fringillina Curtis, 1836. Australia, New Zealand. (Extralimital: Palaearctic Region). Chiefly on Passeriformes, Galliformes and Falconiformes.

Ornithomya fuscipennis Bigot, 1885. Australia, New Guinea. Chiefly on Coraciiformes and Strigiformes.

Crataerina hirundinis (Linnaeus), 1758. Japan. (Extralimital: Palaearctic Region west to Japan.) On *Delichon urbica* Linnaeus.

Myophthiria capsoides Rondani, 1878. Philippines. On *Collocalia* spp.

Myophthiria lygaeoides Rondani, 1878. Amboina. On *Collocalia* spp.

Myophthiria reduvioides Rondani, 1875. Borneo. On *Collocalia* spp.

Ornithoctona australasiae (Fabricius), 1805. Japan, Philippines, Java, Tondano nr. Celebes, New Guinea, Solomons. Chiefly on Passeriformes and Columbiformes.

Ornithoctona fusciventris (Wiedemann), 1830. Hawaii. (Extralimital: Nearctic and Neotropical Regions.) Chiefly on Passeriformes.

Ornithoctona soror Ferris, 1926. Borneo. On Dicruridae.

Ornithoctona plicata (von Olfers), 1816. See discussion of species.

Icosta australica (Paramonov), 1954. Queensland. On Megapodiidae.

Icosta simplex (Walker), 1861. Celebes, New Guinea. On Columbidae and Megapodiidae.

Icosta maquilingensis (Ferris), 1924. Taiwan, Philippines, Borneo, Java. (Extralimital: Burma, Thailand, Vietnam.) Chiefly on Phasianidae.

Icosta albipennis (Say), 1823. See discussion of species.

Icosta omnisetosa Maa, n. sp.[3] New Guinea. (Extralimital: Malaya.) On Rallidae.

Icosta cacatuae Maa, n. sp. New Guinea. On Psittacidae, particularly *Cacatua galerita triton* Temm.

Icosta suvaensis (Bequaert), 1941. Fiji. On hawk and parrot.

Icosta nigra (Perty), 1833. Hawaii, Galapagos. (Extralimital: Nearctic and Neotropical Regions.) Chiefly on Falconiformes.

Icosta sensilis Maa, n. sp. Philippines. (Extralimital: Thailand, Malaya.) On Passeriformes.

Icosta lonchurae Maa, n. sp. Taiwan. (Extralimital: Thailand, Malaya.) On Ploceidae.

Icosta nigrita (Speiser), 1905. Philippines. On Falconidae.

Icosta wenzeli Maa, n. sp. Philippines. Chiefly on Psittacidae.

Icosta bicorna (Ferris), 1927. Philippines. On Bucerotidae.

Icosta bucerotina Maa, n. sp. Borneo. (Extralimital: Thailand.) On Bucerotidae.

Icosta parallelifrons (Speiser), 1902. New Guinea, New Britain, Solomons. Chiefly on Corvidae and Sturnidae.

Icosta tuberculata (Ferris), 1927. Philippines. On Corvidae and Sturnidae.

Icosta longipalpis (Macquart), 1835. Java, Borneo, Philippines. (Extralimital: Ceylon, Thailand, Sumatra.) On Falconiformes.

Icosta acromialis (Speiser), 1904. New Guinea. On Alcedinidae.

Icosta elbeli Maa, n. sp. Borneo, Philippines. (Extralimital: Thailand.) On Cuculidae.

Icosta trita (Speiser), 1905. Taiwan. (Extralimital: Burma, Thailand, Vietnam.) On *Megalaima* spp.

Icosta diluta Maa, n. sp. New Guinea. On cuckoo-shrike.

[3] Descriptions of the new *Icosta* species listed here will be published in a world revision of that genus (in preparation).

Icosta samoana (Ferris), 1927. Samoa. On Muscicapidae.

Icosta plana (Walker), 1861. New Guinea. Chiefly on Paradisaeidae.

Icosta fenestella Maa, n. sp. Taiwan, Philippines, Borneo, Java. (Extralimital: Thailand.) On Passeriformes, particularly Corvidae.

Icosta chalcolampra (Speiser), 1904. Taiwan, Philippines, New Guinea, New Britain, Solomons. (Extralimital: Thailand.) Chiefly on Falconiformes and Psittaciformes.

Icosta dioxyrhina (Speiser), 1904. New Guinea, New Britain, Solomons. On Bucerotidae.

Pseudolynchia serratipes Maa, n. sp. New Guinea. On dove.

Pseudolynchia canariensis (Macquart), 1840. Ryukyu Is., Taiwan, Philippines, Sumatra, Java, Australia, Hawaii. (Extralimital: Africa, Europe, continental Asia, N. America, S. America.) On Columbidae, particularly domestic pigeons.

Pseudolynchia garzettae (Rondani), 1879. Taiwan, Philippines. (Extralimital: Thailand, Ethiopian Region, Mediterranean Basin.) Chiefly on Caprimulgidae and Strigidae.

Microlynchia galapagoensis Bequaert, 1955. Galapagos. On Columbidae and Accipitridae.

Olfersia sordida Bigot, 1885. Galapagos. (Extralimital: Neotropical and southern Nearctic Regions.) On Pelecaniformes.

Olfersia fossulata Macquart, 1843. Philippines, Wetar I., Cocos I., Galapagos. (Extralimital: Neotropical Region.) On Pelecaniformes.

Olfersia fumipennis (J. Sahlberg), 1886. Sumba. (Extralimital: Finland, Russia, Red Sea.) On *Pandion haliaetus* Linnaeus.

Olfersia aenescens C. G. Thomson, 1869. See discussion of species.

Olfersia spinifera (Leach), 1817. See discussion of species.

Ortholfersia minuta Paramonov, 1954. Queensland, New South Wales. On kangaroo.

Ortholfersia bequaerti Maa, 1962. Queensland. On Macropodidae.

Ortholfersia phaneroneura Speiser, 1902. Queensland, New South Wales, Tasmania. On *Protemnodon* spp.

Ortholfersia macleayi (Leach), 1817. Queensland, New South Wales. On Macropodidae.

Austrolfersia ferrisi Bequaert, 1953. Queensland. On Macropodidae.

Hippobosca equina Linnaeus, 1758. Japan, Java, Madura, Bali, Lombok, Flores, Sumbawa, Salayer, Philippines, Celebes, Amboina, New Hebrides, Loyalty Is., New Caledonia, Fiji. (Extralimital: India, Palaearctic and Ethiopian Regions.) On horses and cattle.

Hippobosca longipennis Fabricius, 1803. Japan (?), Hainan. (Extralimital:

Ethiopian and southern Palaearctic Regions, India, Ceylon, Indo-China.) On dogs.

Hippobosca variegata Mégerle, 1803. Celebes, Flores, Sumba, Timor, Rote I. near Timor. (Extralimital: Ethiopian and western Oriental Region.) On horses and cattle.

Lipoptena japonica Bequaert, 1942. Japan. On *Capricornis crispus* Temm.

Lipoptena fortisetosa Maa, 1965. Japan. On *Cervus nippon* Temm.

Lipoptena sigma Maa, 1965. Taiwan. On *Cervus unicolor* Bechst.

Lipoptena rusaecola Bequaert, 1942. Philippines. On *Cervus unicolor* Bechst.

Lipoptena pteropi Denny, 1843. Lingga Archip., Riouw Archip., Java. (Extralimital: Thailand, Malaya, Mergui Is.) On *Tragulus javanicus* Osbeck.

Melophagus ovinus (Linnaeus), 1758. Japan, Australia, New Zealand, Hawaii. (Extralimital: Worldwide, in temperate countries.) On sheep.

STREBLIDAE

INTRODUCTION

Streblid flies are of worldwide distribution and are exclusively blood-sucking parasites of bats (Microchiroptera in particular). Heretofore unrecorded from Micronesia, they are most probably poorly represented in those islands. The single species described below apparently belongs to the Polynesian faunal element, since its relatives are at present known only from the Solomons, Fiji, and Samoa.

The United States Office of Naval Research, the Pacific Science Board (National Research Council), the National Science Foundation, and Bernice P. Bishop Museum have made this survey and the publication of the results possible. Field research was aided by a contract between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences, NR 160-175.

I wish to thank Dr. Alan Stone for the loan of specimens from the United States National Museum (US) and Mrs. Donna Ryan for the preparation of drawings.

SYSTEMATICS

Genus **Brachytarsina** Macquart

Brachytarsina Macquart, 1851, Soc. Sci. Lille, Mém. **1850**: 280 (= Dipt. Exot. Suppl. **4**: 307) (type: *B. flavipennis* Macquart; Algeria).

Nycteribosca Speiser, 1900, Archiv Naturgesch. **66**, 1: 46 (type: *Raymondia kollari* Frauenfeld; Egypt).

Head narrowed toward occipital foramen, dorsal and ventral surfaces convex but no depressions for reception of fore coxae. Eye present, one-faceted; postvertex more or less distinct, always bearing some setae. Antennal arista flagelliform, with few branches in apical half. Palpus usually longer than broad, with rounded apical end. Thorax almost spherical, with complete mesonotal suture; humeral callus absent; scutellum with many setae which are usually varied in number, length, and thickness. Wing more than twice as long as broad, with five longitudinal veins and two crossveins; first longitudinal vein (R_1) hardly thicker than second (R_3) and with only its apical part bearing setae; alula well developed, fringed with setae.

This genus is a member of the subfamily Nycteriboscinae (= Brachytarsininae) and contains about 2 Palaearctic, 23 Oriental, and 5 Ethiopian species. It is divisible into three species groups typified by *gigantea* Speiser, *buxtoni* Falcoz, and *amboinensis* Rondani respectively. The single Micronesian species belongs to the second group which is characterized by the pale-colored head, densely setose mesonotum, and broadly rounded thoracic squama. This group is known to be parasitic on bats belonging to Emballonuridae (*Emballonura, Taphozous*), Hipposideridae (*Asellia, Hipposideros*), and Rhinolophidae (*Rhinolophus*), with stray records from Rhinopomatidae (*Rhinopoma*) and Vespertilionidae (*Miniopterus*).

Other streblid genera which may possibly be found in the future in Micronesia are *Raymondia* Frauenfeld (Nycteriboscinae) and *Ascodipteron* Adensamer (Ascodipterinae).

Brachytarsina carolinae Maa, n. sp. (fig. 6).

Body length 1.5 mm. in male and 1.9 mm. in female (in alcohol). Head not darker than body, dorsally rather strongly convex; eye small, transverse; laterovertex evenly covered with fairly long setae, setae of upper rows longer than those of lower rows, longest seta on upper anterior end; mediovertex narrow, not clearly defined; postvertex ovoid, pale, well separated from occiput and laterovertex by colorless membranous ring, bearing four or five pairs of setae at anterior two-thirds; postgena with setae of varied length; occiput with two (1 + 1) setulae behind postvertex, and with a longitudinal series of four to five similar setae at each side. Labial theca hardly longer than broad, broadest behind midlength, covered with small fine setae; its anterolateral margin very gently curved; labella very small, as long as broad. Thorax about as long as broad, uniformly setose all over, setae on scutellum and anterior part of prescutum slightly longer and stronger than those on scutum, dorsal and lateral setae as a whole longer and more erect than ventral ones. Prescutum distinctly longer than scutum which is in turn hardly longer than scutellum; posterior margin of scutellum angulate at middle. Posterior part of thoracic squama broadly rounded. Anterior margin of thoracic venter deeply, angularly incised at middle; within this incision lies a small, pale, bare, triangular plate. Wing length 1.3 mm. in male and 1.5 mm. in female, similar to *B. scutellaris* Jobling in general outline, venation, and setal distribution; but marginal cell (*lr*) with more setae near second longitudinal vein (R_s), and apical abscissae of fourth and fifth longitudinal veins (M_{3+4}; Cu + 1A) much more strongly divergent apicad. Legs fairly robust; femora with dense long setae on dorsal surface, shorter ones on outer surface, and very short, finer ones on ventral surface, largely bare on inner surface; tibiae uniformly covered with dense short erect setae. Abdomen at each side and between laterotergites 1 + 2 and pygidium with dorsolateral patch of very long strong shining black setae in two longitudinal rows near anterior end and three to four such rows near posterior end of that patch; laterotergites 1 + 2 about 1.5 times as long as broad, uniformly covered with strong setae (which are about as long as those on scutum) and posteriorly fringed with very long, dull black setae; sternite 2 large, subtriangular, densely beset with short setae, anteriorly acute, laterally somewhat S-shaped; lateral and ventral membranous area with uniformly short setae. Female sternite 7 very small, subtriangular, with 10 to 12 short setae arranged in three to four longitudinal series, second seta of lateral series the longest of all; proctiger somewhat dome-shaped in dorsal and ventral views, with two rings of setae; setae of first ring longer and much stronger than those of second and composed of four dorsals, two (1 + 1) laterals, and two ventrals; setae of second ring composed of two dorsals, four laterals, and two ventrals; venter of proctiger anteriorly (that is, before first ring of strong setae) with eight small setae arranged in two rows. Male pygidium slightly longer than high in lateral view; with eight small setae around anus and many longer setae on lateral surface; surstylus poorly developed (aedeagus and its basal apodeme not dissected and examined).

Holotype, female (US 68916), Palau Is., Koror, ex *Emballonura* sp., 1945, Marshall. Allotype, male (US), paratype, female (BISHOP), same data as holotype.

DISTRIBUTION: Caroline Is. (Palau).

The type series was originally labeled as *scutellaris* Jobling to which this new species is closely related. *B. scutellaris* [Jobling, 1936, Ent. Soc. London,

Proc. (B) **5**: 177, fig. 1] is so far known from five specimens from Fiji, ex *Emballonura semicaudata* (Peale). It has only two setae on its elliptical postvertex and more numerous setae on female sternite 7 and pygidial venter than has *carolinae,* its labial theca is broadest at midlength and fourth and fifth longitudinal veins are less strongly divergent apicad. In certain respects, *carolinae* is also related to *buxtoni* Falcoz [1927, Insects of Samoa **6**(1): 2, figs. 1-3] but in the latter species, the body is larger, the scutellum distinctly

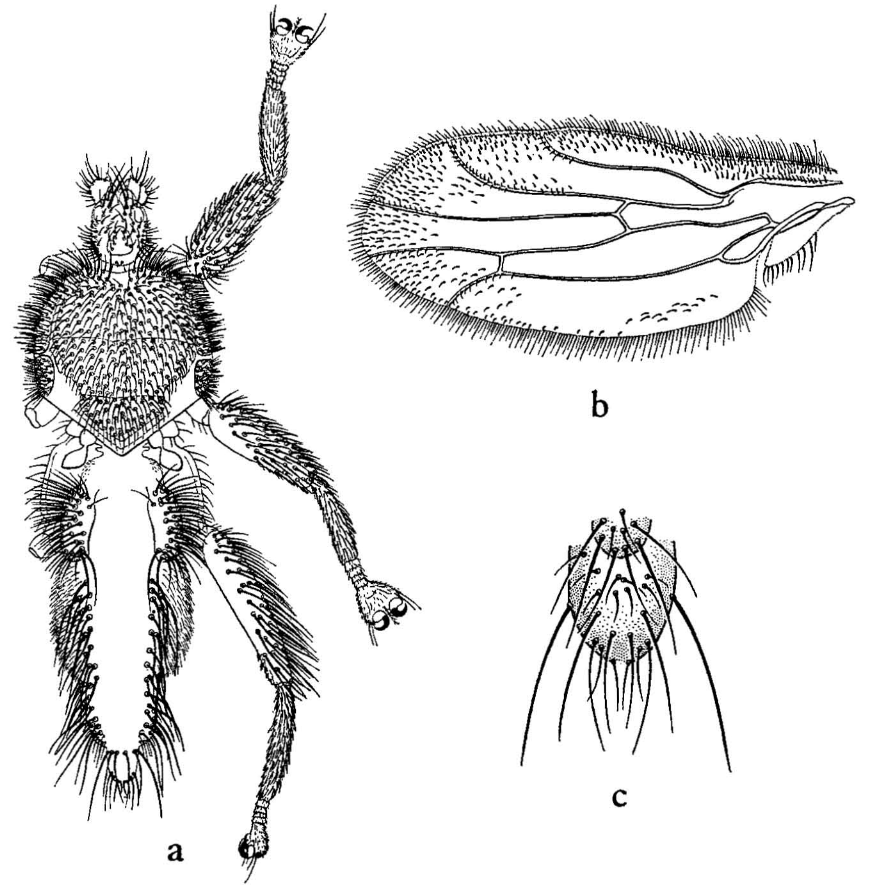


FIGURE 6.—*Brachytarsina carolinae:* **a,** female, dorsal view; **b,** wing; **c,** female, posterior end of abdomen, ventral view.

shorter than scutum and posteriorly rounded, not angulate at middle, the labial theca distinctly longer than wide, and the female sternite 7 different in outline and with more numerous setae. *Buxtoni* is known, so far, from three lots of specimens from Samoa, ex *Emballonura semicaudata.* An undescribed related species in Bishop Museum from the Solomon Is., ex *Emballonura nigrescens* (Gray), also differs from *carolinae* in similar characters.